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|-------------------------------|------------------------|---------------------|--|
| Notice of Allowability | Application No. | Applicant(s) | |
| | 10/667,940 | JOHNS ET AL | |
| | Examiner | Art Unit | |
| | Joni Hsu | 2628 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. This communication is responsive to papers received April 11, 2006.
2. The allowed claim(s) is/are 1-4, 6, 7, 9 and 11-18.
3. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All
 - b) Some*
 - c) None
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) hereto or 2) to Paper No./Mail Date _____.
 - (b) including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. Notice of References Cited (PTO-892)
2. Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. Notice of Informal Patent Application (PTO-152)
6. Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. Examiner's Amendment/Comment
8. Examiner's Statement of Reasons for Allowance
9. Other _____.

DETAILED ACTION

Response to Amendment

1. Applicant's arguments, see page 8, filed April 11, 2006, with respect to Claims 1-4, 6, 7, 9, 11-13, and 15-18 have been fully considered and are persuasive. The 35 U.S.C. 103(a) rejections of Claims 1-4, 6, 7, 9, 11-13, and 15-18 has been withdrawn.

Allowable Subject Matter

2. Claims 1-4, 6, 7, 9, and 11-18 are allowed.

The following is an examiner's statement of reasons for allowance:

3. The prior art taken singly or in combination do not teach or suggest a method comprising identifying a set of commands to be submitted to a processing unit, wherein the set of commands were captured and saved as they were previously submitted to the processing unit; selecting a subset of the set of commands; submitting the subset of the set of commands to the processing unit for processing; analyzing processing performed by the processing unit in response to the subset of the set of commands, wherein if one or more recommendations for using the processing unit are violated by the set of commands, then issuing a warning identifying both the selected recommendation that has been violated and how much faster the frame could have been drawn if the selected recommendation had not been violated, as recited in Claim 1. Claims 2-4, 6, and 7 depend from Claim 1, and therefore also contain allowable subject matter.

The prior art also does not teach one or more computer readable media having instructions that, when executed by one or more processors, causes the one or more processors to modify a stream of commands that were captured and saved as they were previously submitted to a processing unit; and determine the first amount of time required by the processing unit to process the stream of commands and the second amount of time required by the processing unit to process the modified stream of commands and determine a difference between them, as recited in Claim 9. Claims 11-14 depend from Claim 9, and therefore also contain allowable subject matter.

The prior art also does not teach one or more computer readable media having instructions, that, when executed by one or more processors, causes the one or more processors to capture a state of a graphics processing unit and a plurality of commands submitted to the graphics processing unit in order to draw a frame of video; and save the captured state and plurality of commands, including determining whether the memory location was referenced by a previous one of the plurality of commands; if the memory location was not referenced by a previous one of the plurality of commands, then capture the contents of the memory location; and if the memory location was referenced by a previous one of the plurality of commands, then check whether the contents of the memory location are the same as the contents of the memory location when the memory location was referenced by the previous command, and capture the contents of the memory location only if the contents of the memory location are not the same as the contents of the memory location when the memory location was referenced by the previous command, as recited in Claim 15. Claims 16-18 depend from Claim 15, and therefore also contain allowable subject matter.

4. The closest prior art (Schenk US 20040003370A1) teaches identifying a set of commands to be submitted to a processing unit (*associated code that can be executed to render the art asset, [0087], render method data elements transferred to the GPU, [0082]*); selecting a subset of the set of commands (*pointer to a byte code stream that must be executed to render the model, [0088]*); submitting the subset of the set of commands to the processing unit for processing (*render method data elements transferred to the GPU, [0082]*); and analyzing processing performed by the processing unit in response to the subset of the set of commands (*performing data transfer optimizations...simulating the contents of the GPU memory over the executing of the rendering of a model, [0115]*). However, Schenk does not teach determining whether one or more recommendations for using the graphics processing unit are violated by the set of commands.

5. Another prior art (Brown US006631423B1) teaches that the processing unit comprises a graphics processing unit (304, Figure 3), the method further comprising analyzing the set of commands; determining, based on the analysis of the set of commands, whether one or more recommendations for using the graphics processing unit are violated by the set of commands; if one or more recommendations are violated by the set of commands, then selecting one of the violated recommendations (Col. 3, lines 36-48); determining how much faster the frame could have been drawn if the selected recommendation had not be violated (Col. 12, lines 15-27). However, Brown does not teach issuing a warning.

6. Another prior art (Davidson US006446029B1) teaches that if an instruction pipeline stage requires more time to complete than indicated by its corresponding threshold value, then thresholder (520, Figure 5B) asserts a threshold event signal 526 that is collected by an event counter 530 in the performance monitor (Col. 8, lines 62-66). However, Davidson does not teach that the warning identifies how much faster the frame could have been drawn if the selected recommendation had not been violated.

7. Another prior art (Thelen US006557167B1) teaches the user can analyze the set of commands by specifying queries on the performance data, and the computer program is “replayed” by stepping through the graphical representation, gathering information that satisfies the query at each step (Col. 3, line 63-Col. 4, line 5). Thelen describes determining, based on the analysis of the set of commands, whether one or more recommendations for using the processing unit are violated by the set of commands (*identify performance bottlenecks by defining program execution conditions 132 and running computer program 125 under those defined conditions*, Col. 3, lines 31-38). Thelen describes identifying performance bottlenecks by measuring the execution times of different sequences of code segments (Col. 5, lines 1-23) so that the user can inherently compare the difference between the execution times, and the user inherently uses the sequence of code segments that takes the shortest amount of time to execute (Col. 6, lines 31-60).

Thelen describes calling and executing different sequences of code segments (Col. 6, lines 6-23). Therefore, Thelen describes modifying the stream of commands and submitting the modified stream of commands to the processing unit. Thelen describes determining the amount

of time required by the processing unit to process the different streams of commands (Col. 6, lines 31-60). The user can modify the stream of commands and determine the amount of time required by the processing unit to process the stream of commands and the modified stream of commands (Col. 6, lines 31-60). Therefore, Thelen describes determining the first amount of time required by the processing unit to process the stream of commands and the second amount of time required by the processing unit to process the modified stream of commands. However, Thelen does not teach a stream of commands that were captured and saved as they were previously submitted to a processing unit. Thelen also does not teach issuing a warning.

8. Another prior art (Krueger US006173368B1) teaches that the instructions are retrieved from the cache (Col. 2, lines 45-49). The instructions are accessed by referencing memory locations (Col. 1, lines 54-57). Indicators are set in response to new data being received by register 76. The new data is captured (Col. 16, lines 4-17). Krueger describes a C/D indicator (84) indicating whether the data is dirty or clean (Col. 14, lines 13-15). The data is dirty if it has been changed since it was read into register 76 (Col. 16, lines 19-26). If the data is dirty, then the data is captured to be written into the main memory (104, Figure 8; Col. 18, lines 47-54). The data is clean if the data in register 76 has been unchanged since it was read into register 76 (Col. 16, lines 19-22). If the data is clean, then it skips step 104, and therefore skips the capturing of the data (Col. 18, lines 35-41). However, Krueger does not teach capturing a state of a graphics processing unit.

9. Another prior art (Glennon US005805173A) teaches capturing a state of the graphics processing unit and saving the captured state (*Controller 108 contains control logic 260 which controls the video processing. The control logic 260 also has a set of state registers. The control logic traverses control structure list 130 and retrieves each control structure in turn. The values in each control structure are loaded into the state registers*, Col. 9, lines 45-53). However, Glennon does not teach determining a difference between the time required to process the stream of commands and the modified stream of commands.

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Prior Art of Record

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

1. Schenk (US 20040003370A1) teaches optimizing art asset rendering operations by using shader-driven compilation techniques [0019].
2. Brown (US006631423B1) teaches evaluating and optimizing a graphics call sequence generated by a graphics application (Col. 2, lines 52-56).
3. Davidson (US006446029B1) teaches a method and system for monitoring the performance of an instruction pipeline (Col. 2, lines 35-36).

4. Thelen (US006557167A) teaches analyzing the performance of a computer program (Col. 1, lines 51-53).
5. Krueger (US006173368B1) teaches a class categorized storage circuit for storing non-cacheable data until receipt of a corresponding terminate signal (Col. 4, lines 48-62).
6. Glennon (US005805173A) teaches selectively processing portions of a video stream in a computer (Col. 1, lines 7-10).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joni Hsu whose telephone number is 571-272-7785. The examiner can normally be reached on M-F 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on 571-272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JH



ULKA CHAUHAN
SUPERVISORY PATENT EXAMINER